

CONSERVATION OF THE ENDANGERED RIVER TERRAPIN *BATAGUR BASKA* IN THE SUNDERBAN OF WEST BENGAL, INDIA¹

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(With two text-figures)

Key words: River terrapin, *Batagur baska*, endangered species, Sunderban, mangrove.

A status survey of the endangered River Terrapin, *Batagur baska* was conducted in the Sunderban of West Bengal, India from February to May 1994. Intensive searches were carried out to determine the present status of *Batagur* in the wild. Surveys were also conducted in Captive Breeding Centres, village ponds and markets to assess the captive stock and exploitation level. The only evidence obtained for *Batagur* nesting was in Mechua island (Bagmara block) of the Sunderban Tiger Reserve (STR). *Batagur* is rare in the wild and in captivity in India and currently not being exploited commercially. A captive breeding programme is suggested for *Batagur* using existing captive turtles involving villagers for restocking the species in the wild.

INTRODUCTION

India has one of the richest assemblages of chelonians in the world, with 31 species of turtles including five species of sea turtles, 22 species of freshwater turtles and four species of land tortoises (Das 1991). Among them, the River terrapin, *Batagur baska* and Asian giant soft-shell turtle, *Pelochelys bibroni* are restricted to brackish water with a wide distribution in southeast Asia. Uncontrolled exploitation of these species and their eggs has caused serious declines throughout their range (Moll 1990a). *Batagur* has been listed as endangered in the Red Data Book (Groombridge 1982) and in category 1X of the IUCN Action Plan Rating (APR), suggesting highest priority for its conservation (Stubbs 1991). Further, this species is also on Schedule I of the Indian Wildlife Protection Act 1972 (Anon 1991).

In India, *Batagur* was reported to occur in the Mahanadi and Brahmani-Baitarani Delta, Orissa and in Sunderban, West Bengal (Smith 1931). However, no authentic record of its presence on the Orissa coast is available for the last 25 years. The species was

reported as common in the Hoogly river mouth of West Bengal in the mid 19th century (Blyth in Gunther 1864). Interest in the conservation of *Batagur* started in India after its rediscovery in village ponds in 1983 (Moll 1990 a) and observation of three nests on Mechua Island (of STR) in 1988 (Ghosh and Mandal 1990). A small scale captive rearing programme of *Batagur* has existed since then in Sunderban aimed at reintroduction into the wild (Ghosh and Mandal 1990). Four *Batagur* surveys have been conducted between 1983 and 1993 by various agencies (Das 1987; Moll 1990 a, b; Bhupathy *et al.* in press). The present paper deals with the status of *Batagur* in India in the wild as well as in captivity and gives suggestions for its conservation.

MATERIALS AND METHODS

Sunderban

Sunderban (21° 32' - 22°20' N, 88° 03' - 89° 05'E), 24 Pargana district (South), West Bengal is one of the World Heritage Sites. It is located in the Ganges and Brahmaputra drainage and is bound by rivers Hoogly in the west and Raimangal and Kalindi in the east. Bay of Bengal forms the southern boundary, while the northern side has an indistinct boundary comprising of agricultural fields and

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villages. Sunderban is one of the largest mangrove swamps in the world covering more than 12,000 sq.km. About one third of this mangrove area is within Indian territorial limits and the rest is in Bangladesh. Indian Sunderban has four protected areas, namely Sunderban Tiger Reserve (STR, 1330 sq.km), Saznakhali (362 sq. km), Saptamukhi (38 sq.km) and Halliday Island (4 sq.km) Wildlife Sanctuaries (Rodgers and Panwar 1988; Fig. 1). The remaining areas are made up of human habitations, agricultural fields and Reserve Forests.

The Tidal Swamp Forest in Sunderban (Champion and Seth 1968) is rich in flora with about 300 species (Hussain 1994). Dominant species among them are *Phoenix paludosa*, *Excoecaria agallocha*, *Sonneratia apetala*, *Bruguiera gymnorhiza*, *Xylocarpus granatum*, *Rhizophora* spp., *Avicennia* spp. and *Heritiera fomes*. *Heritiera fomes* (known as *Sundri* in Bengali from which the name Sunderban meaning 'beautiful forest' originated) and *Nypa fruticans* are some of the rare species found in the Indian Sunderban. In the sea facing islands, the grass *Saccharum cylindricum* is common. Sunderban is also rich in fauna with 42 species of mammals, 270 species of birds, 35 species of reptiles and 400 species of fishes reported (Hussain 1994). It is an abode for many rare and endangered species; Tiger *Panthera tigris*, Gangetic river dolphin *Platanista gangetica*, Giant heron *Ardea goliath*, Lesser adjutant stork *Leptoptilos javanicus*, King cobra *Ophiophagus hannah*, Indian python *Python molurus*, Water monitor lizard *Varanus salvator*, Common monitor lizard *V. benghalensis* and Saltwater crocodile *Crocodylus porosus*.

Survey and identification of nesting beaches

The study was conducted in the Indian Sunderban between February and May, 1994 covering both egg laying and hatching periods of *Batagur*. Moll (1990b) reported that *Batagur* nests only on the sandy beaches of rivers and the sea. Hence, surveys were conducted first to locate the sandy areas in the Sunderban. Field surveys were done in three phases using a mechanised boat.

Phase I: A rapid survey was conducted from 24th February to 12th March, 1994 along the coast from Mechua island in the east to the river Hoogly, in the southwest covering all major rivers, and primary, secondary and tertiary creeks. All sea-facing islands (Fig. 1) were surveyed on foot during high tide between High Tide Zone (HTZ) and mangrove forest. The following information was recorded to evaluate the suitability for nesting: (1) availability of dry sand (2) turtle nesting signs (3) turtle egg collection by inhabitants (4) fishing and (5) human settlement. Sandy areas comparable with known nesting area for eg. Mechua island, and with less human pressure were shortlisted for further intensive surveys. Field officers of the Sunderban Tiger Reserve (STR), local people and fishermen in the adjoining areas were also interviewed to obtain known records of *Batagur*.

Phase II: Only the Mechua island in Bagmara block of STR was found to be suitable for *Batagur* nesting, and hence the second phase of the survey was restricted to this island. Searches were carried out for three to four days in a week during the morning (0500-0800 hrs) and evening (1600-1900 hrs) between 15th March and 15th April, 1994. The area between HTZ and mangrove forest was included in the search. The habitat was open sandy area with sparse clumps of tall grass *Saccharum cylindricum* well above the HTZ. Tracks and signs were followed to locate nests. The nesting crawl of the *Batagur* may easily be identified from sympatric sea turtles by the following features: (1) lack of deep cuttings in the crawl of *Batagur* i.e. flipper marks and (2) presence of only four claw marks. Signs of nesting of sea turtles and egg predators, such as Wild Pig, were also recorded.

Phase III: Mechua Island was surveyed from 4th to 13th May, 1994 to record the hatching of *Batagur* in the wild. Searches were conducted in the early mornings (0500-0800 hrs) and evenings (1600-1900 hrs) covering the area between HTZ and mangrove forest. Signs of turtle hatchlings were recorded. Open water and potential basking habitats, such as fallen logs, mounds and banks, were also closely observed using a pair of binoculars while

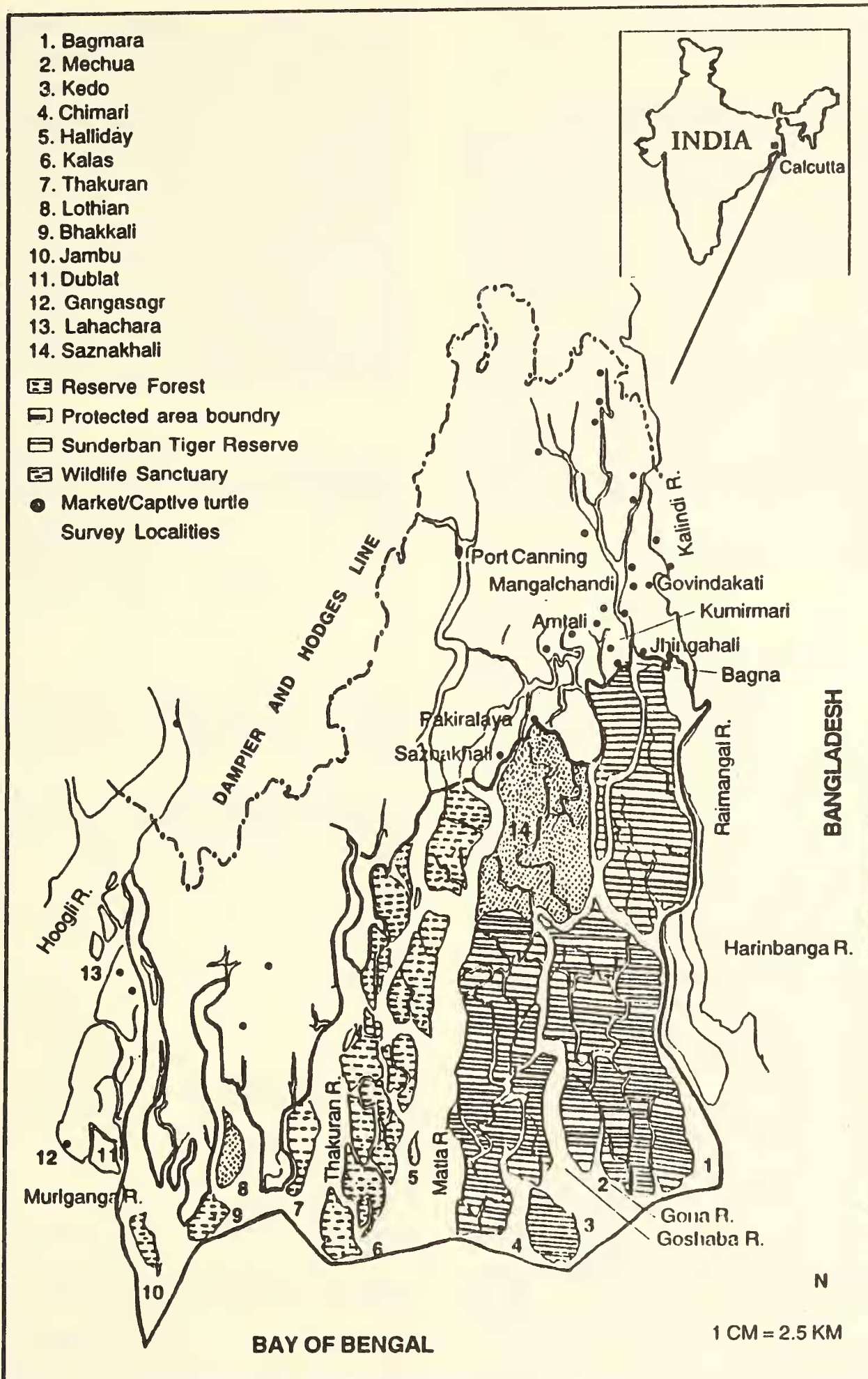


Fig. 1. Indian Sunderban showing major river systems and sea-facing islands.

travelling by mechanised boat during all phases of the survey.

Exploitation level and status in captivity

Fish markets adjacent to STR were surveyed for *Batagur* from 25th February to 20th May 1994 (mainly from 15-20th April and 15-25th May) to assess the level of exploitation by local people. Rapid searches were conducted in each fish market for turtles. Villagers were questioned to determine the number of *Batagur* in private collections. Forest Department Captive Breeding Centres in STR and Alipur Zoological Park, Calcutta were also visited. On locating a shell or live turtle in the wild or in captivity, morphometric measurements, colour pattern and origin of the specimen were noted.

RESULTS AND DISCUSSION

Identity

Altogether three adult male, two female and 19 immature (1-4 years old) *Batagur* were examined during the survey. Morphometry of the largest specimens of both sexes: a) female - Straightline Carapace Length (SCL) 500 mm, Carapace Width (CW) 400 mm, Plastron Length (PL) 450 mm and Body Weight (WT) 17 kg and b) male - SCL 400 mm, CW 320 mm, PL 360 mm and WT 8 kg. Two captive males examined in early March had black heads, yellow-cream eyes and pale brown legs. Females had cream head, black eyes and brown shell and soft parts. *Batagur* of Indian and Burmese (Myanmar) origin are reported to be different from those of Malayan origin. Males of the Malayan forms develop a black head, and their eyes are yellow to cream in colour (Moll 1980) while in the males of Indian and Burmese forms the back of the head and forelimbs are bright red (Anderson cited in Das 1991). The occurrence of Malayan colour form of *Batagur* in the Sunderban is interesting and requires further investigation.

Status of nesting beaches

All major river systems and the thirteen islands facing the sea were surveyed between 24th

February and 12th March, 1994 to assess the suitability of the habitat for nesting of *Batagur*. The river systems surveyed included Raimangal, Harinbanga, Gona, Goshaba and Matla in Sunderban Tiger Reserve (STR) and Thakuran, Saptamukhi, Muriganga and Hoogly outside STR (Fig. 1). None of these rivers had dry sand on their banks. Only some of the sea-facing islands had dry sandy areas. Inside STR only the island of Mechua in Bagmara block had sufficient dry sand during high tide and tracks of *Batagur* were noticed. Islands Kedo and Chaimari had less sandy area (Table 1).

TABLE 1
SUITABILITY OF SEA-FACING ISLANDS FOR
BATAGUR TO NEST IN THE INDIAN SUNDERBAN.

Name of	Dry sand during high tide (1 x w in M)	Disturbance		
		Turtle egg collection	Fisherman seen	Habitation
Bagmara (TR)	1500 x 50	—	—	absent
Mechua (TR)	2000 x 50	—	—	absent
Kedo (TR)	—	—	5	absent
Chaimari (TR)	200 x 3	?	10	absent
Kalas (OT)	2000 x 25	—	10	absent
Chulkati (OT)	500 x 5	—	25	absent
Thakuran (OT)	—	—	50	50 houses
Lothian (OT)	—	—	60	absent
Bakkali (OT)	3000 x 25	+	200	100 houses
Jambu or New or Moor (OT)	3000 x 25	+	150	20 houses
Dublat (OT)	2500 x 25	+	150	50 houses
Gangasagar (OT)	3000 x 25	+	200	100 houses
Lahachara (OT)	—	—	25	absent

Note: TR — Tiger Reserve, OT — Outside Tiger Reserve

Outside STR nine islands were surveyed; none of them had evidence of *Batagur* nesting such as tracks and shells. Four islands, namely Bakkali, Jambu, Dublat and Gangasagar had vast stretches of sandy areas and other islands, such as Thakuran, Saptamukhi and Lahachara had no dry sand during high tide (Table 1). Among the islands located outside STR, island Kalas (Chulkati block, Fig. 1) appeared to be suitable for *Batagur* nesting with sufficient dry sand and comparatively less anthropogenic pressure. Twenty five records were obtained for sea turtle nesting in this island (Table 2). Bakkali, Jambu, Dubalt and Gangasagar had sufficient dry sand during high tide. Sea turtle nesting was sporadic (Table 3) and the disturbance was high due to human settlement (Table 2). Turtle egg collectors traverse the beach every morning and if at all *Batagur* were nesting there, it would have no chance of survival.

TABLE 2
TURTLE RECORDS IN VARIOUS SEA-FACING ISLANDS OF THE INDIAN SUNDERBAN DURING THE SURVEY. Number in parenthesis is hatchlings seen.

Name of the Island	Batagur signs	Number of sea turtle sign			
		Turtle shells	Predated nest	Intact nest	Tracks and young ones
Mechua (Bagmara block)	3 tracks	1	21	2	25 (20)
Kedo	—	—	—	—	—
Chaimari	—	1	—	—	—
Kalas	—	1	20	1	3
Chulkati	—	—	—	—	1
Thakuran	—	—	—	—	—
Lothian	—	1	—	—	—
Bakkali	—	—	—	—	—
Jambu	—	9	—	2	2
Dublat	—	2	—	—	—
Gangasagar	—	1	—	—	—
Lahachara	—	—	—	—	—
Total	3	16	41	5	51

Note: Data on Mechua island is sum of 5 surveys.

The *Kedo* island in which *Batagur* was reported to have been nesting (Das 1987) lacked dry sand and hence nesting there appeared to be quite unlikely. Das (1987) reported nesting of *Batagur* in islands, such as Kanak and Nagbarchar; the former no longer exists, having sunk during the 1988 cyclone, and the latter was not traceable. None of the Forest Department officials, local inhabitants and fishermen were aware of the existence of such an island.

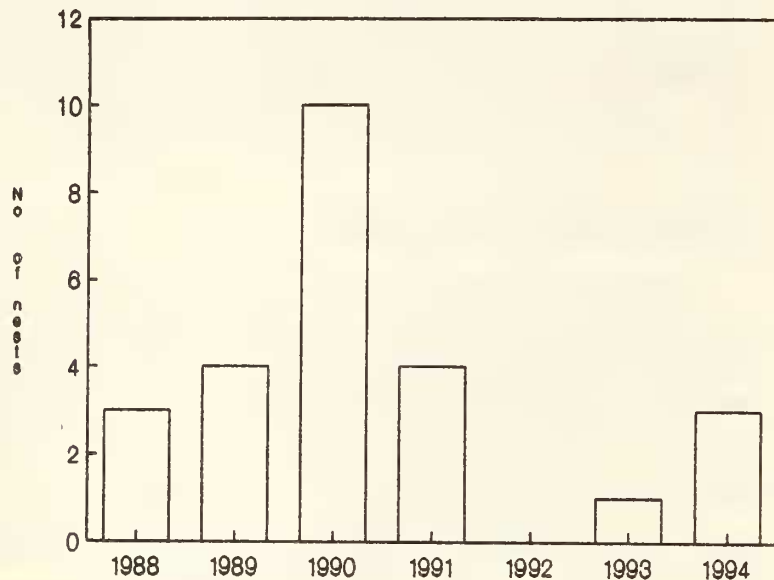
Status of *Batagur* nesting

First phase of the survey showed that only Mechua in the Bagmara block of STR provided suitable nesting habitat for *Batagur*, and hence further surveys were restricted to Mechua island only. The area is about 15 sq. km with 3 km shoreline. It has an area of about 2000 x 50 m (1 x w) dry sand during high tide which is suitable for turtles to nest. Five surveys were conducted in Mechua island, the last one was during the hatching period for 10 days in the first fortnight of May (Table 3). Three *Batagur* tracks were recorded during the present survey which would account for a maximum of three nesting females. All of them were observed by 20th March. This indicates that the nesting (i.e. egg laying) of *Batagur* was probably over by the third week of March.

Seventy records were obtained for sea turtles in Mechua island: one carapace, two intact and 21 preyed upon nests and 46 tracks and young ones. Among the 23 nest records 21 (91%) had been preyed upon by predators, 20 of them by Wild Pig (Table 3). No *Batagur* hatchlings were observed in Mechua island during 4-13 May. However, the hatching of two nests of Olive Ridley Sea Turtle was recorded. Twenty hatchlings of the sea turtle were observed during the survey.

One *Batagur* nest was located in Mechua island during 1993 by Project Tiger officials. This was protected from predators by erecting an enclosure. Hatching success was about 90% and all hatchlings were reported to have been released in the wild (P. Sen Gupta, pers. comm.). Records of *Batagur* nesting in STR since 1988 show a maximum of 10

nests in February-March 1990 (Seth 1993). Three nests were recorded in *Bagmara* block of STR in 1989 and 1991 (Ghosh and Mandal, 1990 and Fig. 2). During the present five intensive surveys, three tracks of *Batagur* have been recorded.



Data source: Ghosh and Mandal (1990), Seth (1993), Bhupathy et. al. (In press) and Present study

Fig.2 *Batagur* nest records in Sunderban Tiger Reserve between 1988 and 1994.

Status of *Batagur* population in the wild

No *Batagur* was sighted in the wild during the 480 daylight hours of survey in the open estuarine system. Queries during the survey revealed that only people living in the northeastern parts of Sunderban were aware of *Batagur*. Based on the past seven years nesting data (Fig. 2), it is assumed that the number of nesting females in STR could be up to a maximum of only ten. Between 1990 and 1994 the Forest Department has released about 40 captive raised young *Batagur* (2-4 years old) in the river Harinbanga of STR (P. Sen Gupta, pers. comm.).

Gunther (1864) reported that *Batagur* was abundant in the Hoogly river mouth. However, during the present survey, no live turtle or nest was recorded in islands located in the Hoogly river mouth: Bakkali, Jambu, Dublat and Gangasagar. These islands have vast sandy areas, but all of them have human settlements. The major occupation of the people is fishing and many of them also poach turtle eggs. Hence, it appears that the population of

TABLE 3
NESTING RECORDS OF *BATAGUR* AND SEA TURTLES IN MECHUA ISLAND. number in parenthesis is hatchlings seen

Survey Date	Batagur signs	Sea turtle sign			
		No. of shells	Predated nest	Intact nest	Fresh sign
5-6 March 1994	2 tracks	—	15	2	6
17-18 March 1994	1 track	—	5	—	9
27-28 March 1994	—	1	1	—	—
11-12 April 1994	—	—	—	—	—
4-15 May 1994	—	—	—	—	11 (20)
Total	3	1	21	2	46

Batagur described earlier by Gunther does not exist any longer and the present status of this species is 'extremely rare' in the Indian Sunderban.

Batagur in captivity

The West Bengal Forest Department initiated a captive breeding programme for *Batagur* in 1988 at Saznakhali in STR (Ghosh and Mandal 1990). In addition to this, rearing centres were established at Pakiralaya, Bagna Range Office and Jinghahali Beat Office in STR (Fig. 1). Twenty one nests were located in the wild between 1988 and 1991 and 645 eggs were collected to be transported to Saznakhali for artificial incubation and captive rearing. Less than 50% of hatching success was recorded (Ghosh and Mandal 1990, and Seth 1993). Captive rearing facilities of STR had only 11 *Batagur* during the present survey. In addition to this, Alipur Zoo, Calcutta had 10 individuals. At present about 25 *Batagur* are with the Captive Breeding Centres (CBC).

Inhabitants of the northeastern parts of STR believe that keeping *Batagur* in their ponds would bring good luck to them. Twenty five villages adjacent to STR were surveyed; only three of them,

Govindakati, Mangalchandi, and Amtali had *Batagur*. Six more villages reportedly had *Batagur*, but the villagers did not co-operate in locating the turtles as they were scared of legal action by the Forest Department. All *Batagur* in the villages appear to be adult as they had cephalic coloration. According to local inhabitants *Batagur* lives in low saline areas. Incidentally, the waters of rivers Kalindi and Raimangal are less saline compared to other rivers in the Indian Sunderban. Queries revealed that till 10-15 years ago, *Batagur* used to be regularly collected by villagers from rivers Kalindi and Raimangal in the northeastern parts of STR bordering Bangladesh (Fig. 1). Low saline areas are mostly outside STR, where fishing activity is high. However, villagers informed that this species was not seen in recent years in the above mentioned rivers.

The survey revealed that approximately 20 adult *Batagur* are still in captivity with villagers. Further, it was learnt that three village ponds had *Batagur* with both sexes (2-4 individuals) together for many years. However, no record exists on successful breeding. The lack of breeding in captivity may be due to various factors such as lack of feeding and nesting habitats, quality food and an insufficient number of adult males and females.

Exploitation level

Seventeen daily and weekly fish markets were checked in Sunderban for *Batagur*. Local people were also interviewed regarding the availability of this species in markets. None of the markets had *Batagur* during the survey. However, one Olive Ridley sea turtle kept alive for sale was seen in Gangasagar market. Markets at Kumirmari and Mollahali had shells of Indian flapshell turtle. The absence of *Batagur* in the markets could be due to its extreme rarity in the wild and special protection offered by Project Tiger officials.

CONCLUSION

The present study shows that *Batagur* is extremely rare in the Indian Sunderban. The rarity

cannot solely be related to its peripheral distribution i.e. westernmost limit (Daniel 1983), as this species was reported to have been common in the 18th century (Gunther 1864) in the Hoogly river mouth of Sunderban. The present rarity of *Batagur* in the Indian Sunderban may be due to over-exploitation and reduction in the breeding and feeding habitat size.

SUGGESTIONS FOR *Batagur* CONSERVATION IN INDIA

1. Monitoring of breeding population

Regular monitoring is suggested for *Batagur* in *Bagmara* block of STR during its nesting period (February-March) to determine the size of the breeding population. Monitoring is essential as the number of breeding females is estimated to be less than ten in the whole of Indian Sunderban. Surveys should be conducted in the early morning hours to avoid possible obliteration of tracks by strong wind.

2. Ecological study

Information on habitat use of an organism is vital for its conservation. Nothing is known about the habitat use of the breeding and non-breeding populations of *Batagur* in Sunderban and elsewhere. As weather conditions are very unstable and man-eating tigers are common in Sunderban, it is extremely difficult to study the habitat preference of *Batagur* in conventional ways, such as direct observation. Hence, satellite radio telemetry techniques may be adopted to study the habitat preference, home range and movement pattern of *Batagur*. This will further help in identifying corridors connecting feeding and breeding habitats of the species.

3. *In situ* conservation

As *Batagur* is extremely rare in the wild and its hatching success in artificial incubation is less

than 50%, *in situ* conservation technique could be useful. The captive breeding programme was started in 1988 by the West Bengal Forest Department using eggs collected from the wild. On an average 50% hatching success was recorded by Ghosh and Mandal (1990). This low hatching success could be due to damage during transportation. In 1993, *in situ* conservation technique was adopted by the Forest Department by protecting nests in the wild, and about 90% hatching success was registered. As anthropogenic pressure is low in the Project Tiger area, *in situ* conservation methods will yield better results. As the nests are extremely difficult to locate in the wild an alternate method namely pig proof fencing may be experimented with, by covering a part of the sandy area (about 2 km) of Mechua island. Protection of larger areas is more advantageous than protecting an individual nest in many ways. (1) The latter case requires tremendous effort i.e. daily monitoring of probable nesting areas to locate nests during egg laying, which is an extremely difficult task, whereas fencing protection requires efforts to fence an area only once in two years; (2) In the protection of larger area, hatchlings would find their own way to the sea, whereas in the latter case, a close watch on the nest is required and hatchlings should be removed from the enclosure soon after hatching and (3) Even though it is known that the eggs of *Batagur* hatch after about 60 days, monitoring would be a difficult task in the unpredictable weather and rough sea conditions that prevail in Sunderban. The pig proof fence would enhance the survival of *Batagur* nests and hatchlings and help build up the population.

4. *Ex situ* conservation (Captive breeding)

Ten villages in the northeastern part of STR have about 20 adult *Batagur* (of both sexes) in ponds and similar number in CBCs. A common *Batagur* captive breeding unit is suggested outside STR using captive turtles. The captive breeding unit should be designed considering ecological aspects involving the villagers. Inbreeding among a small population

of turtles may be avoided by replacing males, if available, from the wild. Captive bred *Batagur* may be released in the wild after about 4 to 5 years. The restocked turtles should be monitored by marking them. Records relating to the released turtles should be properly maintained for future reference and monitoring.

5. Awareness programme

The inhabitants of Sunderban should be made aware of the rarity of *Batagur*. This may be done by publishing a poster with descriptions in the local language giving species identification, past and present status, and biology. The locals of Sunderban may be requested to inform Project Tiger officials on encountering a *Batagur*.

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